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2 February 1981

West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 1/81)

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CONTENTS

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TRANSPORTATION

BRIEFS

METHANOL AS COAL CARRIER--The transport of ground coal through pipelines with water as the carrier is state-of-the-art technology. The disadvantage is that separation of water and coal at destination or incineration of the coal mud requires energy. In some cases this type of coal transport cannot be used at all because there is no water or insufficient water at the coal mining site, or because of the danger that the pipeline will freeze (underground installation is expensive). For this reason the use of alternate carriers, e.g., oil, methanol, liquefied gas or oil-water mixtures, has come under discussion increasingly. Carriers of this type have the advantage that they can be produced partially from coal itself. They do not constitute ballast in transport and can be used at destination as fuel or chemical raw materials. Also, the return pumping of the carrier to the pipeline head station can pay out. To better assess the theoretical, experimental, large-scale technological and economic viewpoints of this technology, especially with methanol as the carrier, the federal minister for research and technology has entrusted Krupp Industrie- und Stahlbau [Krupp Industrial and Steel Construction], Duisburg-Rheinhausen, and Mannesmann Anlagenbau AG [Mannesmann Plant Construction, Inc] of Duesseldorf with preparing a study on the subject, "Hydraulic transport of coal through pipelines, especially with the use of methane [as published] as the carrier liquid." The Krupp Research Institute of Essen, the Mannesmann Research Institute of Duisburg and the Universities of Aachen and Karlsruhe are collaborating on the study. The results are to be available at the end of 1980. [Text] [Hamburg ERDOEL & KOHLE-ERDGAS-PETROCHEMIE in German Sep 80 p 402] 5586

METHANOL FUEL TESTS--After research experts from VW, Veba Oel [Veba Petroleum] and Aral had first proved the suitability of "M 15" (internal combustion engine fuel with a 15-percent addition of methanol) and "M 100" (pure methanol) in a high-temperature and high-altitude test in the Spanish Sierra Nevadas, there followed in February 1980 the cold test at Swedish Kiruna. To supply the test vehicles, Aral sent the first "methanol service station" to the northern polar circle. Evaluation of the test results, now completed, shows that the technological application problems with methanol can be solved by precise adaptation of motor vehicles and motor fuel composition. [Text] [Hamburg ERDOEL & KOHLE-ERDGAS-PETROCHEMIE in German Sep 80 p 403] 5586

CSO: 3102

ENERGY

EC TO HELP SPONSOR PHOTOVOLTAIC POWER PLANTS

Duesseldorf STAHL UND EISEN in German 6 Oct 80 p 1212

[Article: "Projects for Advancing Solar Cell Electricity in the European Community"]

[Text] The EC Commission is planning, in collaboration with individual national agencies, public corporations and industrial and other establishments, on a cost-sharing basis, the construction in Europe of more than a dozen electric generators driven by photovoltaic cells with power outputs ranging from 30 to 300 kW. All facilities together will have a capacity of about 1 MW and are expected to be completed by mid-1983.

Such a generator has not yet been built in Europe. The focus of this project is the development of innovative technology. Ultimately the installations are to demonstrate that the concept of generating electricity from solar energy is economically feasible in Europe. At the same time, this program can give the solar-energy electrification projects in developing countries a boost since it will create the required technological base. The solar power plants will be selected from more than 30 proposals submitted to the EC Commission in May by numerous European consortia in answer to an advertised request for proposals within the scope of the Solar Energy Research and Development Program of GD (XII) Research, Science and Education.

The response by the European industrial community was more animated than expected and shows that there is growing involvement with solar technology.

The commission intends that as a rule at least one installation will be built in each EC member country, even in the northern countries.

This is possible because photo cells work with a good degree of efficiency not just in direct sunlight but also under cloudy skies and even in the rain, provided there is still some light present.

Solar electric generators will come into use primarily on islands where generating electricity by conventional means cannot always be easily accomplished. "Solar Electricity" can also be used for supplying small communities, rural operations like dairies, hospitals, schools and recreation centers. One facility will be built in Sicily alongside "Eurelios," the EC's 1-MW steam-cycle solar power plant, which will be put into operation at the end of this year. This would create the

unique opportunity for comparing a photovoltaic facility with a thermodynamic solar power plant.

All projects are part of the commission's program for utilization of solar energy via photovoltaic cells, which also embraces 35 study contracts dealing with new solar cells and associated components. These contracts are presently being negotiated.

From 27 to 31 October 1980 the commission is sponsoring at the Palais des Festivals et des Congrès in Cannes a conference dealing with photoelectric technology which is expected to draw over 600 participants from all over the world. Cosponsors of the conference are the Paris-based "Commissariat à L'Energie Solaire" and IEEE, New York.

9160
CSO: 3102

PRESENT STATE OF ART IN INDUSTRIAL ROBOTICS

Milan IL MONDO in Italian 5 Dec 80 p 128

[Article by Pierpaolo Bollani: "With a Dea in the Factory"]

[Text] Delivery is scheduled for Christmas; as of that date Dea of Torino (a company that specializes in the design and construction of measuring systems, with net sales for 1980 of 27 billion lire) will have sold the second unit of the Pragma A 3000 robot. The customer is Fiat who will use it experimentally for the assembly of the steering lateral rod in one of its models. The first unit had been sold a few months ago to Aspera, a manufacturer of automobile parts of the same Fiat group. For the small Torinese firm this means not only a good order (the price of the machine is about 100 million lire), but also the fact that Pragma represents one of the most advanced stages in the area of assembly robots. And assembly robots are the last technological obstacle to be overcome before the mechanical industry, using mass production, is able to take a definite step towards the complete automation of the factory. Until now, robots in the automobile industry have replaced man only in the painting section or in welding work. For automation to have arrived in the assembly line means an enormous leap forward.

These robots can repeat human movements. The Pragma bought by Aspera, for instance, assembles the parts of the compressor valve plate; this involves 12 parts which are assembled by two independent arms at the rate of 320 parts per hour, a job that would normally take four workers.

The characteristic of this robot, as compared to traditional assembly machines, is that it is intelligent; that is, it can respond to the unexpected. If a part arrives defective (each part is fished out from a basket where all components have been dumped helter-skelter), the robot sets it aside. If it arrives backwards, the robot straightens it before starting assembly operations. Each arm operates independently but it knows what the other one is doing. Dea has recently sold to the American General Electric (which has been doing research in this field for some time) the exclusive rights for the production and sale of this machine in the United States, Canada and Mexico; and for the sale only, without exclusive rights, in the rest of the world. For 1981, the Torinese company anticipates the construction of about 30 units.

The Pragma is not the only manipulation robot of this type in existence in the world but it certainly occupies a foremost technological position. However, there is a long way to go before it can be applied to mass production. The most important research in Europe is being done by Renault at its Billancourt center in France, where 100 technicians are employed. The problem to be solved in these situations is how to make the machine recognize the part that is placed before it. The methods used are divided in two large groups: visual and tactile. Renault chose the former. Is it possible for a machine to see? All it needs is to have a telecamera installed to focus on the object, and a computer.

Renault affirms that is can market, at a reasonable price (about 100 million lire including the robot, the calculator, the television system and the necessary software) a machine capable of carrying out in a determined period of time the picture analysis and identification of the object. The field of tactile technology is dominated by the American Cincinnati and the Swede Asea giants (their units are already in operation at General Motors, Ford and British Leyland). With this method the robot cannot see; it identifies the objects and reacts accordingly only after touching them.

All these three machines (Renault, Cincinnati and Asea) are motion robots, capable of handling large-sized parts (from 60 to 80 kilograms each), and considered multipurpose: they can perform a large variety of operations, including assembly. Pragma, instead, specializes exclusively in assembly, and in this area (the machines handle parts not exceeding 6 kilograms in weight) Dea shares the field with few competitors. One is Olivetti, which together with its Sigma unit opened the way 4 years ago (since then about 150 Sigmas have been built); another is the American Unimation (the company that designed Unimate, the welding robot in use also at Fiat) with its Puma. But the biggest danger could come once more from the Japanese, who are making enormous advances in the field of research. Regarding visual methods, for instance, the University of Nagoya is already experimenting with color. To have an idea of how far this road can lead, suffice it to mention that Seiko has designed a machine that makes Seiko watches. Starting from individual parts the machine assembles them and turns out a watch that is not only complete but has also been tested and is ready for sale.

9674
CSO: 3102

INDUSTRIAL TECHNOLOGY

LARGE-SCALE AUTOMATION EFFORTS PROCEED AT AIRBUS INDUSTRIES

Paris AIR & COSMOS in French 29 Nov 80 pp 12-13

[Article by Jacques Morisset]

[Text] To be able to produce up to eight Airbuses a month by 1984--and possibly 10 a month by 1985--AEROSPATIALE [National Industrial Aerospace Company], like its German and British collaborators, will have to plan on large-scale investments not only as regards fabrication and assembly and finishing lines but also as regards design methods, since they must prepare for the future, that is, beyond the A 300, the A 310 and the A 300-600. They must, that is, be planning now on their new planes, which will probably be the SA 1/SA 2 and the TA 11, not forgetting the TA 9, which is the large capacity version of the A 300-600.

The key word is informatics: One runs into it everywhere--the shops as well as the research departments. Thus it is that the year about to end has seen a "significant increase in automation of the design facilities, necessitated by the growing demand for studies, qualitative and quantitative."

Two computers of the same family, a Cyber 750 and a Cyber 174, have replaced the CDC set, which consisted of a 6600 and a Cyber 172. The result has been:

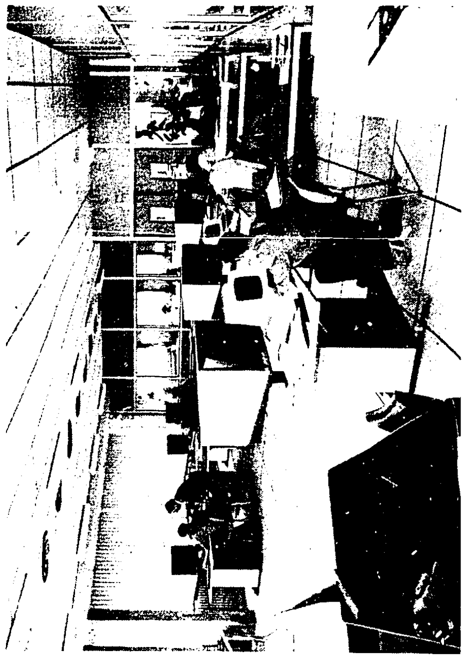
--a tripling of calculating speeds (the current system is capable of processing 8 million operations per second);

--a doubling of the memory storage capacity, which is now 5 billion characters;

--a doubling also of the number of processing consoles connected to the computer, with 66 consoles to be installed by the end of this year and 140 planned by 1983-1984.

A major effort is being realized in the realm of CAO [computer-aided design]. In addition to the two CDC positions for the study of shapes, the research department had already installed, by the end of 1978, an initial automated Computer Vision system for its design departments. As of now, five systems have been installed, and two others are to be installed by year-end to complete a total of 40 work positions available to the designers of mechanical parts and electric cabling layouts.

A section of the Research Department



Department where magnetic tapes are prepared for use in digital-controlled machines. This department, which has been operating for several months now, is also scheduled for expansion.

Left: Airbus 130, being built for Iberia, in paint shop. It takes 1,000 kg of materials to paint and decorate one Airbus, but this dries down to 300 kg. Total surface requiring sanding, cleaning, priming and painting: 1,000 m^2. Required time now 6 days.

Right: Polytrace machine for finishing wind-tunnel models.

After finishing and surfacing, comes inspection. This Mauser machine provides a high-precision check of final exterior contours against pre-planned shapes.

All these systems are linked to the central research computers and include all necessary peripheral equipment (drawing tables, etc.).

Also noteworthy is the installation, in a 350-square meter building, of a highly specialized and highly automated shop for the fabrication of scale models for use in wind-tunnel testing. Its purpose--to halve the total production cycle of a wind-tunnel model -- has been achieved. The central equipment is a digital-controlled Polytrace finishing machine linked directly to the CAO and completed by an inspection machine.

As for machines, it is evidently impossible to cite them all. Some examples are:

At Blagnac, the new Airbus jet-engine strut, called the polyvalent strut* because it is equally usable with the General Electric and the Pratt and Whitney jet engines, is being manufactured. Its assembly requires the drilling of 1,600 holes by means of Recoules Types HS 1 and HS 2 drilling units. The work position will be modified to conform to the installation of a Renault ACMA Model 80 programable manipulator. This set of equipment will be digital-controlled, the recording support being a simple magnetic tape cassette. The necessary modifications will be completed in 1 year, and the manufacture of these struts by means of this tooling will begin in January 1982.

Also at Blagnac, there is a digital-controlled pipe-bending machine. Associated with a Vector 1 tube-gaging machine, it operates directly from the CAO instructions input at the research department. Other higher-capacity machines are to be installed in the tubing shop.

The electric shop, which manufactures the cabling for Airbuses (around 150 km of wire per plane), was confronted by a difficult problem: The various companies required different variations that could involve changes of the order of 20 percent. An electrical specifications data management system was therefore worked out, that enabled the direct control of fabrication by means of special machines that make the cable to order and cut it to the proper length (CONRAC W MM 502 machines). Three machines of this type are now in service, enabling the making up without errors of "personalized" cabling for each plane only a few months prior to the plane's completion.

At Saint-Eloi, investment in modern machine tools is reaching significant levels. We were able to see, for example, under technical acceptance testing, a first Mandelli finishing machine belonging to a new generation of digital control. This machine is capable of effecting a tool change in 9 seconds, drawing from an assortment of 40 different tools associated with it. Its machining accuracy is within 0.002 millimeters. Its use upsets quite a few classic milling concepts, in that it becomes possible to have it work upon families of parts chosen according to the tools contained in its storage facility.

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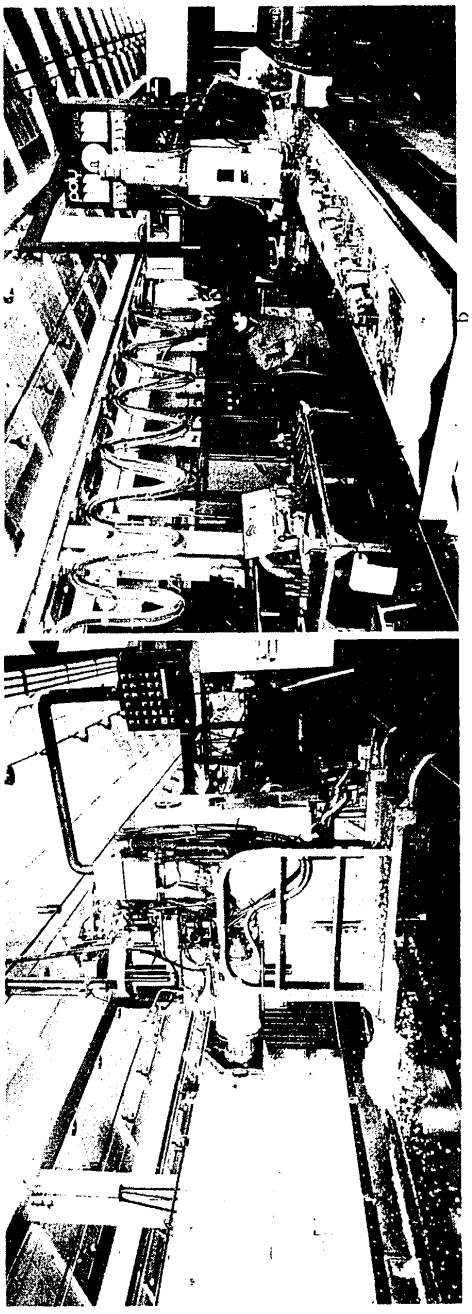
* Formerly titanium, now steel.



a. Forest H2 1700 2-head, 3-axis machine, finishing a light-alloy panel. Power: 50 hp. Speeds: 1,000-6,000 rpm.

b. Intertech MOM 1200 TA digital-controlled miller: 4-axis head. Power 15 hp. Speeds 15-670 rpm. Table measures 1.2m x 9m.

A large digital-controlled Polytrace miller is used to machine large-dimensioned steel parts up to 15 x 2.4 meters. In 1983, this machine will be 30 meters long and will have three multiple-spindle, automatic tool-loading gantries. It rests on a concrete bed 6 x 3 x 40 meters. The presently installed section of this machine now weighs 140 tons. Delivery is being awaited on a miller of the same size for light alloy parts.

The sheet metal shop is equipped with a new (Loire) sheet metal stretching press capable of exerting 300 tons of traction and 600 tons of vertical force. Capacity: width 4 meters; mouth 3.2 meters. Noteworthy also is the refitting of the sheet metal bending shop, based on the recommendation of a "leadership group" within this shop.

A new chemical finishing shop has been in operation since mid-August. It includes a 35,000-liter finishing-bath (soda) tank, a sulfo-chromic bath tank of the same capacity, and two rinsing water tanks. This array permits the chemical finishing of panels up to 8 meters in length, 2 meters in width and having a maximum swell of 1 meter.

The treatment of steel and titanium surfaces (cutting, chemical finishing, painting, polishing, sanding) centers in a shop equipped with 25 specialized-treatment tanks and 16 rinsing tanks. A special machine is used to harden metal by bombarding it with very tiny balls of glass and aluminum. Capacity: 8m x 2m.

Lastly, there is the digital-controlled-machines preparation department, which sets up the required magnetic tape for the CAO logic, based on key parameters (tool diameters, cutting speeds, alveolate or contour machining). This enables optimization of tool trajectories, elimination of superfluous calculations, optimization of arrays and reduction of material wastage, and, in the final, analysis, a reduction in cost of preparation and production. This department has been operational since June 1980 and its expansion is being planned.

A subsequent article will deal with the automated warehouse of the future.

9399
CSO: 3102

INDUSTRIAL TECHNOLOGY

ELECTROEROSIVE FINISHING OF, WITH ALUMINUM TOOLS

Duesseldorf VDI-Z in German No 19, 1980 special part pp 251-252

[Text] With the increasing use of aluminum for making foam, blow and spray molds for plastics manufacturing and stamping tools in which only the highly stressed parts are made of steel, interest is increasing in the application of spark erosion for working aluminum. Since the aluminum alloys used for molds and tools are easily machined, mold cavities are largely premilled. In spark erosion of steel, mold electrodes made of aluminum can be used; thus, for example, pressure-cast aluminum parts already on hand can be used as electrodes for the production of additional pressure casting molds.

1. Introduction

The electrical removal process called spark erosion is today indespensable in the building of forming tools. Quite recently spark erosion has taken on added significance, especially for working special materials. A spark erosion installation with today's supporting modules represents an economical extension of conventional removal processes.

The main advantages of spark erosion are:

-- The hardness of the work piece plays no significant role in erosion, i.e., tool blanks can be hardened before erosion and rework due to warping during hardening is thus not required. Also, hard-to-machine steels, sintered materials, tungsten and titanium can be worked;

-- Good reproducibility with close tolerances;

-- Short schedule for tool building and

-- Largely automatic processes with low labor costs.

2. Installations for Spark Erosion Work

An arc erosion installation generally consists of three functional groups: a processing machine, a generator and filter and a voltage system for receiving

the electrodes. Because of the continuously increasing requirements on tool accuracy, arc erosion machines must have an extremely stiff frame so that the X and Y axes of the compound table are plane parallel and form a right angle with the Z axis. The filters have to be designed so that the dielectric can be held at a constant temperature with the aid of ancillary equipment. This is absolutely necessary since otherwise frame inaccuracies are induced by strains resulting from temperature variations.

The new generation of generators is distinguished by high removal rates with minimal electrode attrition. In addition, in the new generators it is possible to find optimal settings for special materials by varying the parameters working current, impulse time and dwell in the microsecond regime.

A medium-sized spark erosion installation which fulfills all of the previously listed requirements is shown in Figure 1.

Figure 1: Medium-sized spark erosion installation

3. Process Engineering Basis of Spark Erosion of and With Aluminum

The technical support from manufacturers of spark erosion machines is still not very extensive because of the relatively small user group in the field of aluminum tools and the large number of alloys used. In addition to the well known material pairs like E-Cu/St, C/St, St/St and HM/St, more and more materials are being worked by spark erosion in recent years, including the erosion of aluminum tools with E-Cu electrodes and the erosion of steel tools with aluminum electrodes.

This type of fabrication is characterized by the following:

--Production of several copies of a steel tool for making pressure casting molds wherein the electrodes are made from production parts of aluminum or an aluminum alloy. The most important advantages of this type of tool making are the easy production of electrodes and good reproducibility.

--Fabrication of experimental tools from aluminum for plastics manufacturing. The advantage lies in simplified tool making due to the fact that aluminum can be worked faster.

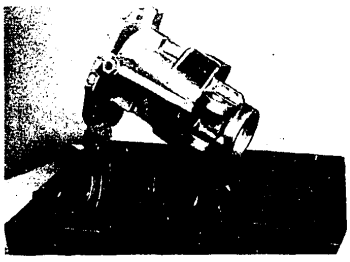
--Making of production tools from aluminum, for example spray and foam tools for plastics. A prerequisite for the use of aluminum tools is that the plastic used in production does not have an eroding effect on the tool.

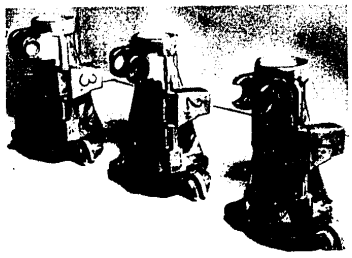
--Making from aluminum production tools which have contours that are hard to mill or cast, for example carburetors for automobile engines.

4. Fabrication Examples

If the technical data (characteristic working values) of the material pair E-Cu/St are compared with those of the E-Cu/Al pair, the following differences are noted. Assuming the same surface quality requirement, the removal rate (V_W in mm^3/min) for working aluminum is 2 to 3 times as great as for working steel. The resulting electrode attrition (% Vol-%) is equal to or less than the corresponding value for working E-Cu/St, that is under 0.5 Vol-%. A prerequisite for achieving these values is perfect rinsing capability.

As already mentioned, it is possible to manufacture steel tools with aluminum electrodes. The pressure molding tool for a transmission case shown in Figure 2 was eroded with electrodes made of original pressure-cast aluminum production parts. The idea of making a tool in this way has, of course, been known for a long time; what has changed over the years however is that the required number of electrodes has been significantly reduced. The half mold was completely eroded with three aluminum electrodes as in Figure 3, that is original production parts of satisfactory surface quality and shape accuracy. For a working depth of about 65 mm, the erosion time amounted to about 65 hours.





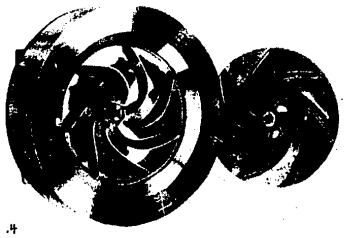


Figure 2: Steel half-mold for pressure casting made using production aluminum castings as electrodes

Figure 3: Electrodes used to make the pressure-casting mold of Figure 2 showing varying degrees of erosion

Figure 4: Eroded pressure-casting mold for a blower wheel and the cast-aluminum production part used as electrode

In case the geometry of the tool exhibits parts which are difficult to erode, preworking with a E-Cu electrode is possible.

Figure 4 shows a pressure casting tool for a blower wheel having electroeroded recessions. Also in this case pressure-molded production parts were used as electrodes. The production cost ratio between conventional and spark-erosion processing amounts to about 4/1 since the pressure-molded parts used as electrodes are reasonably priced and can be easily adapted to the spark erosion machine.

9160
CSO: 3102

KORF DEVELOPING NEW PIG IRON PRODUCTION PROCESS

Duesseldorf STAHL UND EISEN in German 6 Oct 80 pp 1207-1208

[Text] Korf Steel AG, Baden-Baden, is developing a new process for the production of pig iron and reducing gas in a single-smelt gasifier. An experimental facility with a capacity of 60,000 t/year is presently being built in collaboration with the Austrian Voest Group at the Baden Steel Mill in Kehl/Rhein.

The objective of the process, called the "KR Process," is the use of lowgrade coal in a fluidized coal bed without expensive refining. Sponge iron fed in from above is heated as a reducing gas is being generated by injection of steam and oxygen. A high temperature zone in which the sponge iron is melted is created at the bottom of the fluidized coal bed by injection of oxygen. The temperatures in the fluidized bed are controlled at values between 2,000 and 2,500 degrees C inthe high-temperature zone and decrease toward the top of the bed to values between 1,000 and 1.400 degrees C. The pressure in the reduction chamber is maintained at 3 to 5 bar. The principle of the process is indicated in Fig 1[1].

[Figure 1. on following page]

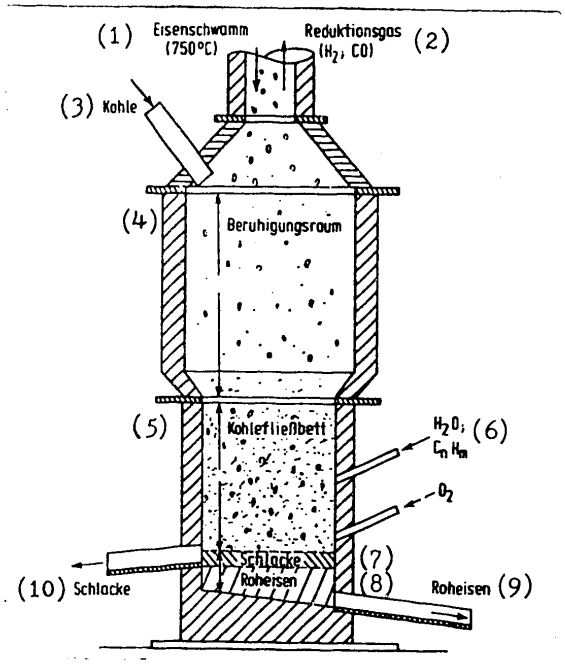


Figure 1. Schematic Representation of the Single-Smelt Gasifier of the Kr Process

Key:

1. Sponge iron
2. Reducing gas
3. Coal
4. Settling chamber
5. Fluidized coal bed
6. Steam and hydrocarbons
7. Slag
8. Pig iron
9. Pig iron
10. Slag

The fluidized bed has a strong braking effect on the crushed sponge iron fed in from above, producing a dwell time of several seconds which is sufficient to ensure that the sponge iron melts in the slag region. The fine particles melt in the upper portion of the fluidized bed.

Coal of grain size up to 12 mm is used; however, because of instantaneous degassing, the grain size of the coke in the fluidized bed generally ranges from 2 to 3 mm. The speed of the gas flowing up through the fluidized bed is kept below 25 cm/s so that the least possible amount of coal is carried out of the stack.

To produce a very high temperature the oxygen is preheated to values between 350 and 450 degrees C. The temperature and composition of the reducing gas are controlled by injection of steam and hydrocarbons about mid-way up the fluidized bed. The reducing gas can be injected into an attached but separate direct reduction unit. Figure 2 is a schematic showing a combined installation for the production of pig iron from iron ore[1].

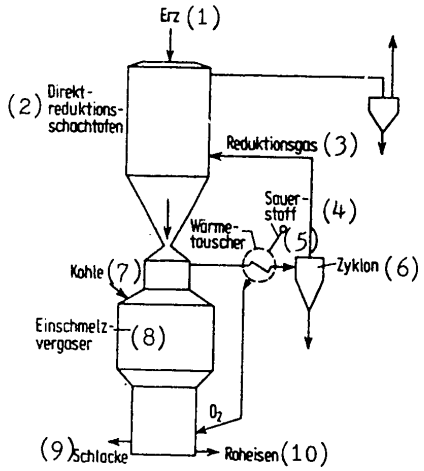


Figure 2. Combined Installation for Production of Pig Iron by the Kr Process

Key:

1. Ore
2. Direct reduction stack furnace
3. Reducing gas
4. Oxygen
5. Heat exchanger
6. Dust extractor
7. Coal
8. Single-smelt gasifier
9. Slag
10. Pig iron

An additional process of the Korf Group for direct application of noncokeable coal was recently presented at the Fourth ILAFA Direct Reduction Conference by the Midrex Corporation[2]. In this process the heat required for reduction of the iron ore is generated in an ore and coal charge by electric resistance heating[3].

FOOTNOTES

1. DOS 2843303 of 4 Oct 1978.

2. Goette, E. and D. Beggs: "Prospects for Present and Future Developments in the Technology of the Direct Reduction Process." In: "Proceedings of the Fourth International ILAFA Direct Reduction Conference," Buenos Aires, 27 to 30 July, 1980, Report X.

3. STAHL UND EISEN 99 (1979), pp 210-211.

9160
CSO: 3102

INDUSTRIAL TECHNOLOGY

BRIEFS

MACHINE TOOL INDUSTRY--In spite of growth rates in the past year, the French machine tool industry is not entirely satisfied. In its estimation growth could have been even higher. The industry is, however, confident for 1980 since an increase in replacement demand by France's machine-tool customers is expected. The industry also expects a lift from setting new export priorities. Between 1978 and 1979 French production of metal-working machine tools increased in value from FF 3.36 billion to FF 3.73 billion and in quantity from 72,399 t to 74,434 t. Exports increased from FF 1,726.9 million to FF 1,950.4 million and imports from FF 1,306.9 million to FF 1,608.4 million. Domestic sales of machine tools reached 66,343 t with a value of FF 3.65 billion in 1979 compared to 58,717 t valued at FF 3.38 billion in the previous year. The growth achieved in 1979 is considered unsatisfactory in view of the fact that French production had already reached 100,000 t in 1971 and that domestic sales had reached a high of 115,000 t in 1973. [Text] [Duesseldorf VDI-Z in German No 19, 1980 p X] 9160

CSO: 3102

SCIENCE POLICY

STRUCTURE, DIRECTIONS OF GOVERNMENT SUPPORT OF R&D OUTLINED

Stockholm VECKANS AFFARER in Swedish 6 Nov 80 pp 34-35

[Article by Lars Herlin: "Nobody Dares To Cut Costs--But Good Ideas Lacking"; passages between slantlines printed in boldface]

> [Text] There is an area which escapes all red pencils in the government's great search for cutting costs: expenses for research and development. And here the government and the opposition try to outdo each other in generosity. The problem is to find suitable recipients for grants. The risk is great that many businesses have not found their way through the jungle of R&D grants.

Minister of Industry Nils G. Asling has closed the emergency clinic--but government clinics for preventive health care are still open. There are still resources, but perhaps not sufficient for "patients." During the past years the government has built up a number of institutions which help businesses to invest in research and development--with the emphasis on development.

Government investment in technical and industrial R&D is something which the government, the opposition, and business want more of.

This year Swedish industry invested more than 6 billion kronor in R&D. More than 15 percent, about 1 billion, came from the national treasury. The Swedish Government's share of the R&D costs in the private sector is relatively little. In market-economic countries such as the U.S. the government's share is up around 35 percent--gigantic space and defense programs contribute to the high American figures.

The large political R&D question is not whether the government will contribute, but how. Future austerity plans are as little likely as the present plans to disturb the government's R&D investment, with the possible exception of the university. This despite the fact that R&D is an area in which shortsighted cuts are easy to make. Research grants can be reduced without hurting large groups. R&D investments are farsighted and do not give immediate results.

The National Board for Technical Development (STU) writes in its budget request that "the relationship between R&D investment and the rate of growth of the economy show no direct connection." But for the politicians it is clear that it is the researchers and innovators who will save us from ruin when basic industries shrink.

Who Was First?

A part of the political R&D debate deals therefore with who first recommended increased investment and who invested most.

Minister of Industry Nils G. Asling confirms for example that the investment in R&D increased from 1.5 percent to almost 2 percent of GNP. "That is a rate of growth which probably makes Sweden unique in the world," said the minister of industry, who regards this investment as a reason for increased optimism.

But Kerstin Niblaeus, who is a doctor of engineering and the social democrats' research expert, is critical of the industry minister's description: "Research in the natural sciences and technical research have increased their share of the GNP, but the available statistics from OECD only go back to 1977. Furthermore, the increase has taken place during a period of stagnating GNP. Talking with individual researchers, one often finds that they complain that the resources have, in real terms, decreased."

An SCB [Central Bureau of Statistics] analysis of the national R&D appropriation shows that these increased in 1977-78, but that they later declined in their share of both government spending and GNP.

In the political debate the social democrats will gain points from insisting that the party spoke four years ago of the need for increased investment in technical and natural sciences research. Now the party will advocate increased tax-free benefits for R&D investments. The social democrats also suggest new development firms in future areas. Big business itself always says that advance government stockpiling within new technical areas is the best practicable route toward new industries.

Difficult To Get a Comprehensive View

The bourgeois governments have shown their appreciation of R&D by creating a number of new cash sources for development grants to industry. Through funds, boards, and committees the government has created a protective net which will receive the nation's good ideas and translate them into viable businesses.

It is difficult to get a comprehensive view over all the government inputs to industrial development. Sweden does not have a special minister for R&D as France does, where R&D is regarded as having its own value. In Sweden each professional department is responsible for its own area. Education, industry, and defense have the largest R&D investments.

VECKANS AFFARER has here made a catalog of grants to manufacturers with new ideas. But the definition of R&D is flexible. Government grants to industry visualize mainly the development of products in their late stages. A large number of the grants are given to create viable businesses from ideas.

/The National Board for Technical Development/ (STU) has a budget of 500 million kronor [Mkr], of which more than 130 Mkr is passed to individual firms. The university and the Trade Research Institute get a large share of the STU cake. STU enters research at a very early phase. It is here that an inventor can get support to develop an idea.

In spite of its small budget STU has a key role when it comes to financing the R&D efforts of small and medium-sized businesses. STU finances between one-third and one-fourth of the R&D investments which businesses with less than 100 employees carry out. STU funds with grants up to the prototype stage. Obligations to repay apply to projects which are promising.

/The 24 development funds/ give so-called product development loans up to 3 Mkr. This activity has recently been evaluated by the National Industrial Board, a review which can lead to more generous loan terms. Product development loans have really not been the success that was hoped for.

The loan is conditional and need not be repaid if the project does not show a profit. The cause for the lack of interest here is that the business must pay a risk premium of up to 25 percent if the project succeeds. Since the interest capitalizes during the development period the loan doubles in just four years, and becomes a heavy burden on the balance sheets of smaller firms. The Industrial Board is going to recommend changing the terms of the loan, probably so that the risk premium is eliminated.

/The Industry Fund/, which was begun one year ago, gives conditional loans of between 5 and 50 Mkr. The fund received its starting capital of 300 Mkr, which is entirely aimed at large businesses and works with larger development projects of a size between STU and the Investment Bank.

/The Investment Bank/ gives loans in the final phase of the development process which go for production equipment and the start of series production. The managing director of the bank, Arne Callans, said, "We have very good liquidity and large scope for advancing new loans. We only lack contacts with more customers."

/Regional Development firms/ such as Regioninvest, Dalainvest, Malmohusinvest, Startinvest, Oxeloinvest, Svetab and others can go in and support promising firms with loans or equity capital. These wholly owned, partly owned, and communally owned development firms are intended to create businesses out of product ideas, but they can also contribute to R&D investment. By not being government agencies, these firms can apply their investments to a number of different ideas.

/Norrlandsfonden/, for the four northernmost counties, will in the future focus to a still higher degree on development projects. The fund controls over 30 Mkr per year.

/Regional political loans/ for R&D are another possibility for firms to get support for new product ideas. The conditions for these loans are, however, so unfavorable in comparison with other support possibilities that this type of loan has not yet been used.

/Nordic Industrial Fund/, which is partly financed by the Swedish government, gives loans and grants to Scandinavian development projects. In this year's budget there is 18 Mkr for this purpose.

/Free university research/ FOSAM [cooperative research] offers investigations for smaller firms. About 60 researchers have been loaned out for this experimental activity which will continue until 1981. Interested businesses can apply through the secretariat of the university.

/Council for Building Research/ gives grants to R&D projects which are of general interest to the building trade.

/Labor Industrial Safety Fund/ makes grants for R&D projects which create new products for the improvement of worker safety.

/Techniques devised for underdeveloped countries/ can get special R&D grants, arranged through STU.

Large investments in the energy field have left their marks on a number of different agencies, which distribute R&D money which is within reach of business. Energy oriented firms with ideas on savings possibilities or energy alternatives can apply to the following authorities:

/National Council for Building Research/ this year has an appropriation of 57.5 Mkr for energy research in housing construction. There is 30.7 Mkr for demonstration construction, and 44Mkr for experimental buildings with solar heating, for example.

STU has 41 Mkr for projects on the use of energy in industrial processes.

/National Industrial Board/ has 100 Mkr in appropriations to develop prototypes and demonstration installations for energy saving.

/National Board of Agriculture/ has 1 Mkr to apply to prototypes and demonstration installations for finding energy saving possibilities in agricultural production.

/Nuclear Power Industry/ has a tax-financed R&D activity.

/Petroleum Substitute Fund/ will in 5 years build up a resource of 2.5 billion kronor for large alternative energy investment. Part of the fund will probably be used in R&D.

/Committee for Energy Production Research/ has 164.2 Mkr in this year's budget for R&D activity in alternative energy fields. Some believe that there are all too many energy research organizations. The managing director of the treasury, Sven Moberg, has recommended that the government should take a combined grip on energy research and create a special energy research institute. That recommendation is now being considered in government offices.

/Ministry of Defense/ is this year investing about 900 Mkr on R&D. About half of this amount will be spent in the defense industry. Reduction in the government R&D budget has hit the Ministry of Defense which had its share greatly reduced. This year only 15 percent of the R&D appropriation in the budget goes to the Ministry of Defense. Three years ago their share was 23 percent.

/Ministry of Industry/ can also grant development funds directly to business. Volvo Flygmotor and Saab Scania have altogether received 648 Mkr to develop three civil aviation engines and one civilian aircraft. Data-Saab is getting a development grant of 32.5 Mkr per year through 1981.

Government support for industrial development activity is not exclusively selective. Former Minister of Finance Gunnar Strang in 1973 created an extra R&D allowance which is appreciated primarily by big business.

According to the regulations the firms can deduct 10 percent of their R&D investments (calculated as 5/3 of R&D personnel salaries and 20 percent of the increase of R&D activity over 2 years). In 1979 businesses deducted 446 Mkr from their income tax. Tax rebates were calculated at about 150 Mkr. When the deduction system was begun it was seen by some as an attempt to reduce business taxes without arousing political attention.

The effect of tax rebates on R&D activity in business has never really been investigated. One department official said that the deductions create a false statistical rise in R&D activity. When the deduction was introduced, businesses carefully searched for R&D personnel among their employees. For instance cleaning persons in laboratories were classified as R&D. Former Saab Managing Director Curt Mileikowsky has recommended an increased R&D deduction, but the Ministry of Budget has until now kept that recommendation on ice.

An approved Riksdag motion for creating three new development firms is also awaiting action in government offices, the Ministry of Industry having discovered the risk of doubling R&D investments.

To the number of supports for Swedish ideas should be added the experimental activities of the Imported Technology Committee. For businesses which can not find new product ideas in Sweden, the committee gives support to the search for licenses abroad. The committee provides half of the cost of finding foreign licenses, including travel costs and own work. The committee calculates an average support of 250,000 kronor per firm. The support needs to be repaid only if the license purchase is successful.

9287
CSO: 3102

SCIENCE POLICY

BRIEFS

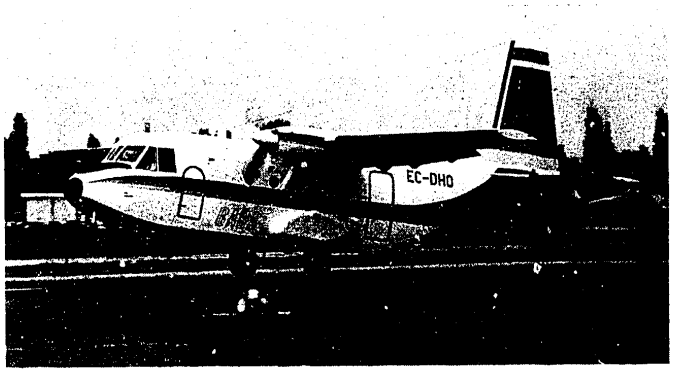
FUNDS FOR ALTERNATE ENERGIES--Up to 40 percent of the total costs of projects for liquefaction and gasification of solid fuels will be paid by the Commission of the European Community as a subsidy. Development of new technologies for underground gasification and development of demonstration plants will be at the center of the EC's support program. If the plant or process is used commercially after completion, one-half of the subsidy is to be paid back. Application forms for the subsidy program can be requested from the EC Commission, Directorate General for Energy, Demonstration Project for Liquefaction and Gasification of Solid Fuels, Rue de la Loi 200, B-1049 Brussels. [Text] [Hamburg ERDOEL & KOHLE-ERDGAS-PETROCHEMIE in German Oct 80 p 492] 5586

3102

CASA SELLS 46 C-212 AVIOCARS IN 1 YEAR

Paris AIR & COSMOS in French 13 Dec 80 p 16

[Text] The Spanish firm CASA [Aircraft Construction Company Inc] announces that it has already sold, this year, 46 C-212 Aviocar twin-turbojets in nine countries; 21 have been sold in the civilian market and 5 in the military market, while the remaining 20 planes are connected with the cooperation program undertaken with Indonesia.



The nine countries involved are the United States, Uruguay, Venezuela, Argentina, Kiribati, Gabon, Switzerland, and, of course, Indonesia and Spain.

The Aviocar had been introduced into the United States in 1979, and placed in service in Alaska by Air Logistics, an offshore operator. Since the end of 1979, CASA has been represented in the United States by American CASA Distributor, Inc, which has already purchased 19 Aviocars, 7 of which are already being used by 4 commuter airlines and other 3rd-level operators.

Uruguay has bought five Aviocars, on a military basis, but will use two of them in the civilian domestic network of the Pluna company, a "subsidiary" of the air force. Venezuela has ordered two Aviocars, and Argentina, one.

Indonesia, with its new batch of 20 Aviocars, has now purchased a total of 68 airplanes of this type. The planes are being assembled by Nurtanio, which also makes a considerable part of the Aviocar, and is also designing, in cooperation with CASA, a new transport plane, the CN-235.

The Republic of Kiribati (Pacific Ocean) is putting the plane in service in the local company Air Tungaru. Gabon is using one Aviocar in the Compagnie Air Service, and is awaiting a second one. In Switzerland, the airplane has been placed in service in Avincomair.

As of the end of November, CASA had already sold a total of 229 Aviocars, 190 of which have been effectively delivered. The number of purchasing countries comes to 18. CASA plans to increase the rate of production of this airplane--all the more so because new short-term sales prospects seem to be opening up in the Middle East, the Far East and Latin America.

The plane being marketed at present is the C-212-200, equipped with two Garrett-AiResearch TPE 331-10-501C turbojets of 900 shaft HP. This version, equipped, has an empty weight of 4,115 kg, with maximum permitted takeoff mass of 7,300 kg. The plane can carry up to 26 passengers (on seats positioned at 79 cm from one another) or 2.7 tons of freight. Cruising speed at 3,000 m and 80 percent of available power is 190 knots (353 km/hour), while the runway length required (including 15-m ways) is only 565 m. Range with full fuel tank, but without reserves, is 1,600 km.

11267
CSO: 3102

TRANSPORTATION

ELECTRONIC SYSTEM TO CONTROL 400 TRAINS PER DAY

Milan CORRIERE DELLA SERA in Italian 16 Dec 80 p 11

[Article by Mario Righetti: "A Science-Fiction System Is Controlling Genoese Railway Traffic"]

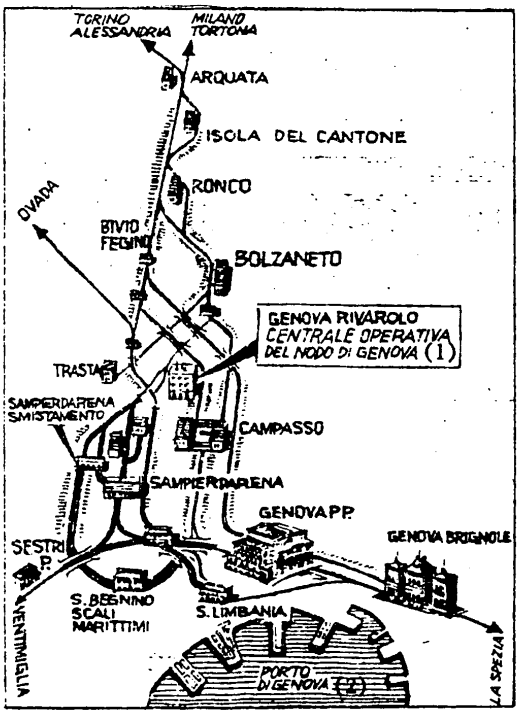
[Text] A highly sophisticated electronic system for the centralized control of traffic in the Genoese railway network will enter into operation with the next summer schedule, but it has already been partially in operation for the past few months to give the personnel involved an opportunity to obtain practical experience.

The system was engineered and put together by Ansaldo and is unequaled in any other railway center not only in Italy but throughout Europe, at least in its extensiveness and operational quality.

Therefore, for obvious reasons it can be asserted that in the case of railway lines connecting with Genoa the future has begun.

The Genoese network conprises 19 stations (9 of which are manned) and many crossings. About 400 trains pass through the network every day (there will be more than 1,000 in the future) with the simultaneous presence of more than 40 trains, each traveling at a different speed and having different characteristics. The tracks in this system have an overall length of more than 200 km (with thousands of switches and signals).

[Map on following page]



Nel disegno di Mellone il nodo ferroviario automatizzato

Mellone's sketch showing automatically controlled railway network

Key:

1. Operative exchange of Genoese network.
2. Port of Genoa.

The experts were faced with the following problems: how to show the entire layout on a colered television screen as well as the position, number and characteristics of every train in transit; and how to have an instantaneous up-to-date forecast of the itinerary of a given train and its possible incompatibility with the itineraries of other trains moving simultaneously within the network.

These are not the only problems. Another is how to suggest a series of alternative itineraries and submit them to the operator in question so that he might decide the best itinerary for each train. And still another: how to activate the chosen itinerary through remote control even in network stations not manned. In fact, it must be considered that of the 19 peripheral stations only 9 are manned, while the other 10 are not attended by any personnel.

In other words, the operative exchange, which is headquartered at a specially built modern villa in Rivarolo (see above map), is not restricted to controlling the traffic of the many trains which enter and leave the Genoese network (in this case it would have been sufficient to have a modern ACEI apparatus of which there are so many in the network's more important stations), but, thanks to various computers interconnected and forming a single complex capable of "thinking" and "giving suggestions," it can completely or, if you wish, partly replace the human operator and perform faultless operations which would normally require an abundance of time.

Thus, between the machine and the human being, whose work is reduced to a minimum. we have created a sort of symbiosis which leaves the visitor bewildered and perplexed in the face of certain "suggestions" and interventions made by this electronic superbrain which, although constructed with a myriad of microcircuits, seems to possess--if not a soul--at least its own personality.

8568
CSO: 3102

TRANSPORTATION

BRIEFS

DIGITAL AUTO PILOT FOR A 300--The first flight of Airbus No 3, a flight-test airplane of Airbus Industrie, equipped with a digital Automatic Flight Control System (CADV) from Sfena/Smith Industries/Bodenseewerk, took place on Monday 8 December. The test crew consisted of Bernard Lespine and Pierre Baud, test pilots; Jean-Pierre Petit and Philippe Morville, test engineers; and Bernard Kamps, test flight engineer. The first digital-CADV evaluation flights are planned for next week, the week of 15 November. We shall return to this important event next week, for it marks the effective beginning of full-scale evaluation of the digital CADV of the A 310 and of the A 300-600--this latter well before the first flight of the A 310. [Text] [Paris AIR & COSMOS in French 13 Dec 80 p 16] 11267

SHORT BROTHERS WINS ORDERS--Short Brothers received many orders during Septemmber. Chatauga Airlines ordered two airplanes of the "360" type, for delivery in 1983. This is the second American company that will use this type of commuter plane (36 seats), after Suburban Airlines (four planes). We recall that the first flight of the Shorts 360 is planned for September 1981. Jet Charter Airlines has signed a contract with a value of more than 5 million pounds for purchase of four Shorts "330's." This contract marks Shorts' entry into the Australian market. It brings the total of 330's sold to 76, to 23 companies in 9 countries. Finally, Arabair (Egypt) has manifested its intention to purchase three Shorts 330's also, plus 2 options. The contract (6 million pounds) should be signed before the end of the month. [Text] 11267

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END